

CLAIMS

1. A heat exchanger for use in temperature control comprising two or more heat transfer elements containing flowing heating or cooling fluid and in contact with a medium whose temperature is to be controlled by the number of heat transfer elements in operation and which can be varied to control the heat transfer capacity of the heat exchanger wherein the number of heat transfer elements in operation is controlled by measurement of the temperature of the medium to be controlled and the actuator for controlling the number of heat transfer elements in operation is contained within the body of the heat exchanger.
2. A heat exchanger according to Claim 1, in which the heat transfer fluid is delivered to each flowing heat transfer element at substantially constant flow and temperature.
3. A heat exchanger according to Claim 1 or Claim 2, wherein the heat transfer area is the only variable controlled by measurement of the temperature of the medium whose temperature is to be controlled.
4. A heat exchanger according to any of the preceding Claims, in which the heating or cooling fluid is a non isothermal heating or cooling medium.
5. A heat exchanger according to any of the preceding Claims, in which the material whose temperature is to be controlled is contained within a single conduit and the variable area heat transfer surface is achieved by segregating the heat transfer fluid into multiple separate conduits which can be opened or closed in a cascade fashion according to the quantity of heating or cooling required.
6. A heat exchanger according to any of the preceding Claims, in which the heat transfer fluid is contained within a single conduit and the variable area heat transfer surface is achieved by segregating the material whose temperature is to be controlled into multiple separate conduits which can be opened or closed in a cascade fashion according to the quantity of heat or cooling required.

7. A heat exchanger according to any of the preceding Claims, which maintains a temperature difference of at least 5°C between the heat transfer fluid and the material whose temperature is to be controlled.
- 5 8. A heat exchanger according to any of the preceding Claims which maintains a temperature difference of from 5°C to 100°C between the heat transfer fluid and the fluid whose temperature is to be controlled.
- 10 9. A heat exchanger according to any of the preceding Claims which maintains a substantially constant temperature difference between the heat transfer fluid and the material whose temperature is to be controlled.
10. A heat exchanger according to any of the preceding Claims in which the heat transfer surface is segregated into 5 or more separate elements.
- 15 11. A heat exchanger according to any of the preceding Claims, which is a plate heat exchanger.
- 20 12. A heat exchanger according to any of Claims 1 to 10, which is a solid block heat exchanger formed of a solid drilled block or a sandwich of sections with machined slots.
- 25 13. A heat exchanger according to any of the preceding Claims, in which the actuator for varying the heat transfer area is a piston which can be moved through the plates or heat transfer elements so as to open or close the heat transfer elements to flow.
- 30 14. A heat exchanger according to any of Claims 1 to 12 in which the actuator is a piston with holes which may be rotated so as to open or close the plates or heat transfer elements to flow.
15. A heat exchanger according to any of Claims 1 to 12 in which the actuator used for varying the heat transfer area comprises of a soft inner pipe being

compressed against a hard outer pipe so as to open up the heat transfer surface in incremental steps.

- 5 16. A heat exchanger according to any of Claims 1 to 11 in which the individual conduits are controlled by multiple separate valves.
- 10 17. A heat exchanger according to any of the preceding Claims in which the valve or valves for variable area control such that the flow through the leading element can be varied for fine control purposes.
18. A heat exchanger according to any of the preceding Claims provided with a control system in which the heat transfer area is varied in order to modify or control the temperature of the fluid whose temperature is to be controlled.
- 15 19. A heat exchanger according to any of the preceding Claims where the heat transfer area is controlled by a signal from the material whose temperature is to be controlled.
- 20 20. The use of a heat exchanger according to any of Claims 1 to 19, for controlling the temperature of air.
21. The use of a heat exchanger according to any of Claims 1 to 19, for controlling the temperature of water.
- 25 22. The use of a heat exchanger according to any of Claims 1 to 19, for controlling the temperature of food products during processing.
23. The use of a heat exchanger according to any of Claims 1 to 19, for controlling the temperature of organic synthesis reactions.
- 30 24. The use of a heat exchanger according to any of Claims 1 to 19, for controlling the temperature of polymerisation reactions.

25. The use of a heat exchanger according to any of Claims 1 to 19, for controlling the temperature of temperature sensitive materials.
- 5 26. The use of a heat exchanger according to any of Claims 1 to 19, for controlling the temperature of continuous reactions.
27. The use of a heat exchanger according to any of Claims 1 to 19, for controlling the temperature of heat exchangers used in road vehicles.
- 10 28. The use of a heat exchanger according to any of Claims 1 to 19, for controlling the temperature of heat exchangers used in applications at sea such as ships or drilling platforms.
- 15 29. The use of a heat exchanger according to any of Claims 1 to 19, for controlling the temperature of heat exchangers used in aircraft.
30. The use of a heat exchanger according to any of Claims 1 to 19, for controlling temperature or measuring heat on very small or micro scale heat exchangers.

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